

A further question of interest which may be asked is, To what extent does the moon figure in this rocket investigation? It should be understood, first, that calculations for minimum initial mass of rocket, which take account of both air resistance and gravity, have shown that, for an average velocity of ejection of gases from the rocket of 12,000 ft./sec., an initial mass of rocket of but 40 pounds is necessary for each pound mass given a sufficient velocity (acquired far above the dense part of the atmosphere) to escape from the earth's predominating gravitational attraction. Actual laboratory tests have produced an average speed of ejected gases of closely 8,000 ft./sec., and results from tests *in vacuo* indicate that this corresponds to a speed of 9,700 ft./sec., *in vacuo*. There is every reason to believe, from results so far obtained and from well-established theory, that a sufficiently high velocity can be secured, with a rocket which consists chiefly of propellant material.

The object of the work is, however, much more than the development of some single spectacular stunt. It is the development of a new method, and although experience has shown that it is hopeless to discuss publicly all the matters which have been studied, both theoretically and experimentally, it is confidently predicted that this method will lead to achievements of the very greatest interest, which can almost certainly be realized in no other way.

New methods are usually slow of development, but it would be well worth while if the means were at hand to make an attack simultaneously upon all the problems connected with this investigation.

#### BIBLIOGRAPHY OF DR. W. DWIGHT PIERCE'S CONTRIBUTIONS ON METEOROLOGICAL EFFECTS ON LIFE

Dr. W. Dwight Pierce, consulting research director, Banning, Calif., has, during the last two years, published numerous articles dealing with physiological effects of air conditions. In response to a request Doctor Pierce has prepared the following bibliography of his papers, covering meteorological effects on life. Since most of the publications referred to are not usually brought to the attention of meteorologists, the publication of this bibliography should be of value to those studying the biological effects of air conditions.—C. F. B.

1. Some factors influencing the development of the boll weevil. *Proc. Ent. Soc. Washington*, vol. 13, pp. 111-114, discussion 114-117, June 19, 1911.
2. The insect enemies of the cotton boll weevil. W. Dwight Pierce, R. A. Cushman, and C. E. Hood, in *U. S. Bureau of Entomology*, Bul. 100, pp. 1-99, April 3, 1912. (3 plates, 26 figs.)
3. Mexican cotton boll weevil. W. D. Hunter and W. Dwight Pierce, Senate Document 305, 62d Congress, 2d session, pp. 1-188, 22 plates, 34 figs., April, 1912.
4. Note on temperature control. *Proc. Ent. Soc. Washington*, vol. 14, p. 87, June 19, 1912.
5. Note on classification of temperatures. *Proc. Ent. Soc. Washington*, vol. 14, pp. 101, 102, June 19, 1912.
6. A new interpretation of the relationships of temperature and humidity to insect development, *Journ. Agric. Research*, vol. 5, No. 25, pp. 1183-1191, figs. 1, 2, March 20, 1916. Abstracted in *Mo. WEATHER REVIEW*, U. S. Dept. of Agric., vol. 47, No. 7, July, 1919, pp. 494-495.
7. The relations of climate and life and their bearings on the study of medical entomology, in *Sanitary Entomology* (Richard G. Badge, publ., Boston, Mass., edited by W. Dwight Pierce), ch. 6, pp. 97-104, March 6, 1921.

Doctor Pierce says: "These articles trace the beginnings of the philosophy in my lecture on 'The Laws of Nature as Affecting Insect Abundance.'"

8. Air conditioning in hospital sanitation, printed in *The Nation's Health*, vol. 4, No. 7, pp. 444-446, July 15, 1922, and reprinted as "Bringing Climate to the Patient" in *The Modern Hospital*, vol. 19, No. 3, pp. 199-202, September 1, 1922; reviewed in *Literary Digest*, February 10, 1923, p. 27.

9. Air conditioning, longevity, and health, *The Nation's Health*, vol. 4, No. 9, pp. 563-566, September 15, 1922.

There is a series of articles running in *The Western Florist, Seedsman and Nurseryman*, printed in Los Angeles (315 South Broadway) on similar lines as applied to the plant: "Treating the plant as a living being" (April, 1923); "Nursery and greenhouse sanitation" (July, 1923); "Tackling difficult problems" (September, 1923); "Climate and the plant" (December, 1923); "Problems the date growers are trying to solve" (January, 1924).

10. The bearing of climate laws on plant and animal activity, appeared in *The Fruitman* (S. F.) Sept. and Oct., 1923.

#### WATERSPOUT AND TORNADO WITHIN A TYPHOON AREA 551.515 (51)

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A tornado in north China is sufficiently rare to merit comment, especially if it chooses its path right through the center of the principal summer resort of the entire foreign community north of Shangtung. Peitaiho Beach (39° 48' N. lat., 119° 30' E. long.) owes its popularity to the fact that it is the first point along the coast east of Tientsin where bedrock is exposed; all the shore to the west is part of the delta formation of the Bay of Peking upon which Tientsin itself is built.

On the afternoon of August 11, a tornado struck the shore and went inland crossing the foreign settlements at its widest point, seriously damaging all the buildings in its track. It showed the characteristics of those in more southerly latitudes. By good fortune the Italian gunboat *Sebastiano Caboto* was anchored almost in its track, and I am indebted to the careful observations of Capt. G. Viganoni for records he has most generously supplied. Also without the cooperation of Mr. R. D. Goodrich, jr., of Tientsin, I should have been entirely unable to secure other data regarding the occurrence.

Local opinion blames the "extra fifth month" intercalated in 1922 with the abnormal weather experienced since that date. In any case the winter and spring were the mildest in 15 years, the summer less hot and the period of autumn rain showers more than usually protracted. The general weather conditions have been unsettled and the damage by typhoons appears comparatively severe, though this latter is not so easy to estimate.

On August 10 the observatory at Siccawei [Zi-ka-wei] near Shanghai had simultaneous warnings out for two typhoons, one being eventually signaled from latitude 28° N. and longitude 122° E.

At 6 a. m. on the 11th it was reported moving north and described as of extreme violence. The local barometer readings at Peitaiho had stayed at 760 mm. (29.92 inches) until the afternoon of the 10th when the sky became overcast. Heavy rain fell during the latter hours of the night, the wind veered from southwest to northeast with the barometer steady at 759.5 mm. (29.90 inches.)

Soon after 1 p. m. the barometer began to fall, the wind veered sharply to west-southwest and increased to 25 f. p. s. (17 m. p. h.). Rain fell all afternoon with increasing violence, passing into a severe thunderstorm. A few minutes after 4 p. m. a brilliant flash of lightning was accompanied by a particularly loud thunderclap that shook the entire settlement.

At the same time about three-quarters of a mile out to sea, the formation of a whirl could be clearly seen.